

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
RESEARCH AND TECHNOLOGY RESUME

TITLE

Research in Planetary Astronomy

(NSG 7323)

PERFORMING ORGANIZATION

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INVESTIGATOR'S NAME

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DESCRIPTION (a. Brief statement on strategy of investigation; b. Progress and accomplishments of prior year; c. What will be accomplished this year, as well as how and why; and d. Summary bibliography)

a) *Strategy*: The objective is the continuation of a long-term research program designed to study the composition, structure and processes operating on the surfaces of solar system objects using the Mauna Kea Observatory with techniques and modern instrumentation mostly developed internally. Reflectance spectroscopy and multispectral imaging in the spectral region, 0.3 - 5.0 μm , are the major techniques used, although thermal (10 μm and 20 μm) radiometry are used in some aspects of the research. Of major importance is the active participation of graduate students and young scientists in order to develop new expertise as well as new knowledge and techniques. Some specific projects include (i) systematic spectral imaging observations of the Moon, (ii) systematic spectral imaging and spectral monitoring of the Martian surface, (iii) thermal radiometry of asteroids as part of the IRAS follow-up and other target specific programs, (iv) searches for asteroid satellites and dust belts using a stellar coronagraph, and (v) studies of circumstellar disks (e. g., β Pictoris) using a stellar coronagraph.

b) *Progress (7/87 - 6/88)*: Progress for each of the programs includes: (i) the completion of the reduction of the spectral observations (0.7 μm - 5.0 μm) of the Martian surface obtained at the UH 2.2 meter telescope under our goal to use the near- and mid-infrared to search for compositional and spatial variations of mafic, carbonate and sulfate minerals; (ii) completed observations of lunar multi-ringed basins and crater deposits in search of high-Ca spectral anomalies; (iii) completed data reduction of an additional 5 asteroids observed by the coronagraphic technique in the search for asteroids satellites and debris clouds; and (iv) completed the reduction and calibration of 350 asteroids observed at 10 μm and 20 μm using the NASA IRTF.

c) *Proposed Research*: We plan to continue our efforts in each of the programs described above (Strategy). Some specific goals this year include: (i) obtain high-resolution spectral reflectance data of the Martian surface in the wavelength region 2.0 μm - 5.0 μm which will be used to detect and determine clay, sulfate and carbonate abundances and composition; (ii) obtain high spatial resolution images of Mars in selected filters between 1.0 μm and 5.0 μm to determine the spatial variability of specific surface minerals and frosts; (iii) apply grating (grism)/imaging (CCD) techniques to the study of ferric-ferrous Fe distribution on the surface of Mars; (iv) apply grating (grism)/imaging (CCD) techniques to the identification of and distribution of minerals on the lunar surface; (v) obtain 10 μm and 20 μm radiometric measurements simultaneous with 0.55 μm photometry (SUMP at the NASA IRTF) of asteroids in the peculiar Eos asteroid family and other anomalous IRAS asteroids to obtain refined albedos and diameters; and (vi) continue the search for satellites and debris clouds around specific asteroids (several William's families suspected of being recent collision events) using the coronagraph.

d) *Summary Bibliography: (7/87 - 6/88)*: This research program provides basic support that increases the productivity of several other research grants. Because of this fact, some of the papers listed were only partially supported by this grant. 3 papers published, 7 submitted.

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